Dzhelepov, B.S.

48-7-4/21

AUTHORS: Gromov, K.Ya., Dzhelepov, B.S., Preobrazhenskiy, B.K.

TITLE: The Spectra of Conversion Electrons of the Neutron Deficient Thulium Isotopes (Spektry konversionnykh elektronov neytrono-defitsitnykh izotopov tuliya)

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 918 - 939 (USSR)

ABSTRACT: After irradiation of the tantalum target with rapid protons the rare-earth elements were, by chemical process, separated from it and thereafter, chromatographically, the thulium fraction. The spectrum of the conversion electrons was investigated by means of a "ketron", which process is described in detail. As a result four lines were discovered which are represented on figure 1 and the values are given in table 2. Table 1 shows the values of the Siborg (Seaborg?) tables on neutron deficient thulium isotopes. Figure 2 gives the conversion lines b, c and d of Tu^{168} and table 3 gives the relative intensities of the conversion transtion lines $h\nu$ = 79,8 keV. Figure 3 records the possible scheme of the decay of Tu^{168}. Figure 5 shows the curves of the D group of the conversion electrons of Tu^{167} and table 4

Card 1/3

The Spectra of Conversion Electrons of the Neutron Deficient Thulium Isotopes

gives the test results with them; table 5 gives the comparison of the test value K/L with the theoretical one in the case of Z = 68 and $h\nu$ = 207,5 keV. A comparison was carried out of the test and the theoretical values of the half-decay period with regard to the γ-transition 207 keV (table 6). Table 7 and figure 6 record the same curves and values for group C. Table 8 shows the theoretical interactions $L_I : L_{II} : L_{III} : \gamma$ at various characteristics of the level 264,2 keV and table 9 records the calculated and the experimental data for determining the characteristic of the level 264,2 keV of Er^{167}, The possible scheme of the decay of Tu^{167} is represented by figure 7. Figure 8 and table 11 show the curves and the experimental data of the conversion electrons of Tu^{165}. Table 12 gives the relative intensities of the conversion transition lines $h\nu$= 77,4 keV, and in tables 13 and 14 the test ralation K/L is compared with the theoretical one for various multi-fields. Figure 9 shows the possible scheme of the decay of Tu^{165}. Table 15 shows the intensity of the γ-rays and of the transitions in the decay of Tu^{165}. On figure 10 the conversion electron curves of Tu^{166} are represented: a) - first series of measurements, b) - second one

48-7-4/21

The Spectra of Conversion Electrons of the Neutron Deficient Thulium Isotopes

after 24 hours and c) third series of measurements (after 48 hours) and on figure 11 the decay scheme of Tu^{166} is represented. Figure 12 shows the dependence on the time of the calculation speed up... the maximal values of all base lines of the thulium fraction. Table 16 records the relative productions of nuclei with various A during the reaction of the "deep separation". All these figures and tables are fully discussed and explained by the authors. There are 16 tables, 12 figures and 39 references 8 of which are Slavic.

ASSOCIATION: Radium Institute im. V.G. Khlopin, AN USSR
(Radiyevyy institut imeni V.G.Khlopina Akademii nauk SSSR)

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Card 3/3

Dzhelepov, B.S.

48-7-5/21

AUTHORS: Bobrov, Yu.G., Gromov, K.Ya., Dzhelepov, B.S., Preobrazhenskiy, B.K.

TITLE: The Spectra of Conversion Electrons of the Neutron Deficient Lutetium Isotopes (Spektry konversionnykh elektronov neytrono-defitsitnykh izotopov lyutetsiya)

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 940 - 953 (USSR)

ABSTRACT: The spectra of the conversion electrons of two lutetium preparations were investigated. One of them was obtained from a tantalum target wall which had been irradiated by protons in the course of 3 months and the other one from a target which had been irradiated in the course of 1 1/2 hours. The measurements of the first preparation began weeks after the irradiation and lasted half a year, those of the second one began 3 hours after the separation and lasted 2 months. In the first case the chromatographic separation took place one week after the irradiation and in the second case 30 hours after irradiation. Lutetium possesses 2 stable isotopes: Lu^{175} and Lu^{176}. Table 1 shows the neutron deficient lutetium isotopes according to published data, where

Card 1/4

48-7-5/21

The Spectra of Conversion Electrons of the Neutron Deficient Lutetium Isotopes

the conversion electrons according to the half-decay period: are divided into 3 groups (150 - 200 days, 8 days and 2 days):
1.) Conversion electrons of lutetium isotopes with a half-decay period of 150 - 200 days.
On table 2 the authors represented their values of the energy and the relative intensities of the conversion lines of the first group and in figure 1 the spectrum of the conversion electrons. Table 3 records the comparison of the test relations K/L and L_{III} $(L_{II} + L_I)$ with the theoretical ones for various multifields and table 4 records the comparison of the experimental data K-L with the theoretical ones for various Z. Figure 2 shows the possible scheme of the Lu^{174} decay and figure 3 shows the scheme of the Lu^{173} decay. Table 5 gives the comparison of the relative intensities of the γ-rays and the conversion electrons (α_K for the transition 78,7 keV is assumed as 5,7).
2.) Conversion electrons of lutetium isotopes with a half-decay period of 7 - 8 days.
The conversion lines of the 1 week isotopes were noticed in the spectrum of the preparation of a lasting as well as a short irradiation. Figure 4 represents the spectrum of the conversion electrons of the lutetium isotopes with T $\sim$ 8 days. Table 6

Card 2/4

The Spectra of Conversion Electrons of the Neutron Deficient Lutetium Isotopes

gives the energy and the relative intensities of the conversion lines of the lutetium isotopes with T $\sim$ 8 days and table 7 gives a comparison of experimental and calculated relations K/L and $(L_I + L_{II})/L_{III}$.

3.) Conversion electrons of lutetium isotopes with a half-decay time of $\sim$ 2 days.

These conversion electrons were only observed in the spectrum of a shortly irradiated preparation. Table 8 shows a comparison of the energy and the relative intensities of the conversion lines observed in the lutetium preparation with the energies and the intensities of the lines γ b^{169}. Figure 5 records the storing and the γ b^{169}-decay in the lutetium preparation with short irradiation. On table 9 the authors state the conversion lines of the lutetium isotopes discovered by them with T $\sim$ 2 days and on table 10 they give a comparison of the test relations K/L and $L_I + L_{II} / L_{III}$ with the theoretical ones for the transition 84,3 keV. Table 11 records a comparison of the experimental data of the difference K - L with the X-ray values. There

Card 3/4

Dzhelepov, B.S.

48-7-7/21

AUTHORS: Dzhelepov, B.S., Preobrazhenskiy, B.K., Rogachev, I.M., Tishkin, P.A.

TITLE: The Spectrum of the Conversion Electrons of No^{160} (Spektr konversionnykh elektronov No^{160})

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 962 - 965 (USSR)

ABSTRACT: The spectra of the conversion electrons of the erbium and holmium fractions were investigated by means of two lense spectrometers. These fractions had been won from tantalum which was irradiated with the energy of 660 MeV.

1.) The spectrum of the conversion electrons of a one day isotope was investigated in several series as long as the source did not decay. After 24 hours, after the elimination of the source, the spectrum manifested itself as shown in figure 1. The half-decay period for the lines which are given in table 1 lie in the domain of 25 to 30 hours which justifies the assumption that all lines of table 1 belong to one isotope. The comparison with published data shows that the observed activity is probably con-

Card 1/2

48-7-7/21

The Spectrum of the Conversion Electrons of Ho^{160}

nected with Er^{160}. It was shown in earlier works that Ho^{160} in the ground and isomeric states is obtained from the decay of Er^{160}.

2.) The holmium fraction was investigated by means of a two--lense spectrometer. Two preparations were investigated: The first one contained besides Ho^{160} an admixture of Er^{160}, therefore the decay curves have a complicated form. The second source was again cleaned; first the erbium fraction was eliminated and after 25 hours the pure holmium Ho^{160}; the intensity of all lines agreed with the period $5,3 \pm 0,2$ hours. Moreover 4 series of measurements in energy intervals of 2 - 200 keV were carried out. The total view of the obtained electron spectrum is represented on figure 2. Table 2 records the line energies and their id entification. There are 2 tables, 2 figures and 5 references, 3 of which are Slavic.

ASSOCIATION: Leningrad State University imeni A.A.Zhdanov
(Leningradskiy gos. universitet imeni A.A.Zhdanova)

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Card 2/2

Dzhelepov, B.S.

48-7-8/21

AUTHORS: Dzhelepov, B.S., Zhukovskiy, N.N., Nedovesov, V.G., Shchukin, G.Ye.

TITLE: The γ-Radiation of $Eu^{152,154}$ (γ-izlucheniye $Eu^{152,154}$)

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 966 - 972 (USSR)

ABSTRACT: The γ-radiation of $Eu^{152, 154}$ was investigated by many scientists, but the complexity of the γ-spectrum and the great interest shown to the nucleus of Eu^{152}_{63} induced the authors to repeat the investigation of the γ-spectrum of the isotope mixture of $Eu^{152,154}$ by means of an improved "electron". The conditions of this work are described. The form of lines and the graduation according to energies are shown on figure 1 and the experimental curve of the spectral sensitivity of the "electron" is shown on figure 2. The experimental curve of the γ-spectrum of $Eu^{152,154}$ is represented on figure 3. According to the taking into account of the dependence of the form of lines on the energy (figure 1) the γ-spectrum, after drawing off the basis, is decomposed into individual components. Figures 4 to 7 record such a decomposition for the sections $H\rho$ = 1400 to 2250, 2800 to 4000, 4000 to 5000 and 5000 to 6300 Gs. cm. The summary curve

Card 1/2

The γ-Radiation of $Eu^{152, 154}$ 48-7-8/21

(the sum of the individual components represented by thin lines) on the whole agrees within the statistic limits with the experimental points. The obtained energy- γ-lines and their relative intensities are given in table 1 together with the data of other authors. The difference in the intensities in certain domains is to be explained by inexact work of the "electron" under its old working conditions. The last works performed with the source of Eu^{154} brought about a considerable clearing up of the isotope decay of Eu^{152} and Eu^{154}, but it was not yet possible to construct a final scheme of the decay of these isotopes. The values on the relative intensities of the γ-lines, which were obtained by the authors, together with the values obtained by other authors make it possible to determine the multifields of the γ-transitions (table 2). There are 2 tables, 7 figures and 48 references, 6 of which are Slavic.

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Card 2/2

Dzhelepov B. S.

48-7-9/21

AUTHORS: Dzhelepov, B.S., Zhukovskiy, N.N., Kondakov, Yu.G.

TITLE: The γ-Radiation of Ag^{110} (γ-izlucheniye Ag^{110})

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 973 - 977 (USSR)

ABSTRACT: Figure 1 records the fundamental data on the decay scheme of Ag^{110} collected hitherto. This work determined the relative intensities of 12 γ-lines of Ag^{110}, whereby it was made possible to check the balance of the intensities on the individual levels as well as to determine the multifields of a number of transitions. The γ-radiation of Ag^{110} was investigated by means of a γ-spectrometer with improved focusing and an "electron" which utilized the emitted electrons. A silver chip of 7,6 g weight activated by neutrons served as source. The measurements were carried out 3 months after the preparation of the source. The total view of the γ-spectrum of Ag^{110} is represented on figure 2. After elimination of the background the spectrum was decomposed into its components which is shown by figures 3 to 5 for the sections 2700 - 3500, 3400 - 4200 and 5200 - 6400 Gs. cm. 12 γ-lines were determined in the γ-spectrum. The resulting

Card 1/2

Dzhelepov B.S.

48-7-10/21

AUTHORS: Dzhelepov, B.S., Kraft, O.Ye., Zhinkina, V.B.

TITLE: Positrons in the Radiation of the Radioactive Isotope In^{114} (Pozitrony v izluchenii radioaktivnogo izotopa In^{114})

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 978 - 984 (USSR)

ABSTRACT: The radioactive isotope In^{114} possesses the possibility of a concurrent β^+-β^--decay. It lies between two stable isobars whose charge differs by two units: Cd^{114}_{48} and Sn^{114}_{50}. This decay is fully described and reference is made to work done in this field by other authors. The radioactive isotope In^{114} possesses two isomers with half-decay periods of 50 days and 72 seconds. The 50 days isomer is converted to its ground state In^{114} by emitting either a γ-quantum with the energy of 192 keV or a conversion electron. The authors further give a survey of data on the In^{114} decay and report on the work done by other authors in this field, where it was for the first time reported on positrons. In order to estimate the intensity and the limiting energy of the positrons the authors used as source an indium foil covered by aluminum as reabsorber. The β-spectrum of

Card 1/2

Dzhelepov, B.S.

48-7-11/21

AUTHORS: Golovanov, I.B., Dzhelepov, B.S., Lebedev, L.S., Prikhodtseva, V.P., Khol'nov, Yu.V.

TITLE: The γ-Spectrum of In^{114*} (γ-spektr In^{114*})

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 985 - 986 (USSR)

ABSTRACT: The relative intensities of the γ-rays of the 49 days In^{114*} were determined by means of a "ritron" under new test conditions. The figure shows the distribution of the emission electrons according to $H\rho$ (after drawing off the background). The peak values corresponding to the 4 γ-lines of In^{114*} 191, 556, 772 and 1300 keV are distinctly to be seen. It has to be noted that in the study of the γ-spectrum of In^{114*} for the first time, by means of the "ritron", a γ-line - 191 keV so soft for this apparatus was investigated. In this domain of energy we did not possess any point on the curve of the spectral sensitivity. In order to obtain this point, the authors used the preparation of In^{114*} The course of the investigation is fully described and explained. The separation of the spectrum was carried out by means of the standard individual lines. The re-

Card 1/2

48-7-11/21

The γ-Spectrum of In^{114}

sult of the analysis is given in the table and the table values are described and explained in detail. There are 1 figure, 1 table and 2 Slavic references.

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Card 2/2

Dzhelepov, B.S.

48-7-13/21

AUTHORS: Dzhelepov, B.S., Shestopalova, S.A.

TITLE: An Investigation of the Spectrum of the γ-Rays of RaC (Issledovaniye spektra γ-luchey RaC)

PERIODICAL: Izvestiya Akad. Nauk SSSR, Ser. Fiz., 1957, Vol. 21, Nr 7, pp. 990 - 1001 (USSR)

ABSTRACT: RaC is a decay product of radium and practically the entire "rigid" part of the radium-γ-spectrum belongs to it. Radium is a radioactive fundamental substance and serves as standard in metrology. Therefore the interest taken by the scientists in the investigation of this spectrum. The RaC spectrum is so complicated that new details are discovered in it with every improvement of the experimental method. 35 lines are hitherto known of it. The energy of the γ-quanta is most accurately determined by means of the spectrum of the conversion electrons and the relative line intensities are best determined by means of the spectrum of the emission electrons. 4 g radium in form of the salt $RaBr_2$ enclosed in 24 glass ampules 4 - 5 mm in diameter and 40 mm in length. The ampules had been placed in 4 boxes of copper foil 50 μ thick (figure 1). The preparation was

Card 1/3

48-7-13/21

An Investigation of the Spectrum of the -Rays of RaC

ASSOCIATION: All-Union Scientific Research Institute for Metrology imeni D.I. Mendeleyev
(Vsesoyuznyy nauchno - issledovatel'skiy institut metrologii imeni D.I. Mendeleyeva)

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Card 3/3

Dzhelepov, B.S.

AUTHORS: Gromov, K.,Ya., Dzhelepov, B. S., Dmitriyev,A.G. 48-12-3/15
Preobrazhenskiy, B. K.

TITLE: On the Decay-Scheme of Lu^{171} (O skheme raspada Lu^{171}).

PERIODICAL: Izvestiya AN SSSR,Seriya Fizicheskaya, 1957, Vol. 21, Nr 12, pp. 1573-1575 (USSR)

ABSTRACT: The spectrum of the conversion-electrons of a lutetium-preparation which was separated from hafnium obtained in the deep splitting off on tantalum was here investigated. Some conversion-lines whose intensity decreased during a period of 7-8 days were obtained. The obtained value of the half-decay period and the taking into consideration of the genetic connection between lutetium and hafnium permitted clearly to ascribe this conversion-lines to lutetium 171. The lutetium-preparation separated from Hafnium was many times weaker than those directly separated from tantalum. Therefore the most intensive and most favorably situated conversion-lines were determined in the former. Thus it may be stated that the transitions with $h\nu$ = 75,8 and 9o,6 keV and the non-identified conversion-lines E_e = 56,6; 57,9; 62,3 keV, which were found in the spectrum of the lutetium separated from hafnium belong to lutetium 171. The inverse fact, however, may not be

Card 1/3

maintained: not discovered conversion-lines may either belong to lutetium 171 or to lutetium 172. Starting from the obtained data something can be said on the decay-scheme of Lu^{171}. The spin of the ground state of Yb171 was measured in reference 3 and is equal to 1/2. The Lu^{171}-nucleus has 71 protons and 1o neutrons, therefore (reference 4) its spin must be the same as in Lu^{175} (71 protons and 1o4 neutrons), i.e. 7/2. Thus an image is obtained which is very similar to the decay of Yb^{169} (spin 7/2) in Tu^{169} (spin 1/2). It would be justified to assume that the decay-scheme of Lu^{171} is also similar to that of the Yb^{169}-decay. In analogy with the decay-scheme of Yb^{169} a scheme of the rotation-band-levels of the ground state of Yb^{171} was set up. The experimental data are in very good agreement with this scheme. It is shown that the Lu^{171}-decay apparently is mainly spent on high excitation-states with a quantum-number $K > 1/2$ and that it is very probably that all or part of the γ-transitions and non-identified conversion-lines which are not connected with the ground-rotation-band of Yb^{171} are produced in the discharge of these excitation-states. The conversion-lines corresponding to the $h\nu$ = 11,3 (m-shell) and 26,2 keV (L-, M- and N-shells) were observed in the Lu^{171}-spectrum by

On the Decay-Scheme of Lu^{171} 48-12-3/15

I.M.Rogachev (State University Leningrad) with the aid of a Kons-spectrometer. The M-11,3 line is badly visible, as it lies near the Auger-electron-lines L-MM and L-NN. There are 1 figure, 1 table, and 5 references, 4 of which are Slavic.

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Card 3/3

Dzhelepov, B.S.

AUTHOR: Dzhelepov, B.S. 48-12-5/15

TITLE: γ-Hodoscope (γ-Godoskop)

PERIODICAL: Izvestiya AN SSSR, Seriya Fizicheskaya, 1957, Vol. 21, Nr 12, pp. 1580-1582 (USSR)

ABSTRACT: In 1951 the author suggested a method by which it was possible to attain a progress in γ-spectrometry. This device was given the name of γ-hodoscope. It was constructed and partially investigated by O.V.Chubinskiy in the State University Leningrad. The operation of the γ-hodoscope: γ-rays illuminate a thin cellophane target and liberate recoil-electrons from it. In a homogeneous magnetic field these electrons move on spiral lines. On their way they pass three rows of Geiger-counters. Every row consists of many counters, every counter is connected with an amplifier and a neon lamp. All lamps lead to the table. In those cases where a triple agreement among the rows exists, the table is photographed. According to the photograph it can be said which counter and in which row reacted. The circle (a projection of the spiral line upon the plane lying vertical to the magnetic field) can be reconstructed according to three points. When the magnetic field is known, Hρ and the corresponding projection

Card 1/3

of the electron-velocity onto the plane lying vertical to the magnetic field, $v_{projection}$, can be found. When the height of counter is not great the electrons only little deviate from this plane and $v_{projection}$ practically coincides with the electron-velocity v. In this manner the electron-energy becomes known. Besides the point of intersection of the reconstructed circle with the target, i.e. the point of origin of the recoil-electron, can be found. When this point is connected with the point where the source is, the narrow limits for the angle under which the recoil-electrons are liberated can be determined. But as its energy is already known, the energy of the γ-quantum can also be determined. This is the peculiarity of the spectrometer: according to every coincidence the energy of the γ-quantum causing it can be determined. The formulae for the plane case are given here. In order to obtain an optimum field for a given energy, tuning shall be made to the recording of the hard γ-rays and thus a correspondingly large magnetic field shall be selected. The difficulties occurring with the γ-hodoscope are pointed out: 1) The electrons must pass 3 rows of counters. By the scattering occurring in this connection an error in the determination of $h\nu$ occurs. This manifests itself in the fact

that the observed lines look blurred. 2) The second error in the calculation of hγ lies in the finite dimensions of the counters. There are 2 figures and 1 reference, 1 of which is Slavic.

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Dzhelepov, B.S

48-12-9/15

AUTHORS: Dzhelepov, B. S. , Zhukovskiy, N. N. , Prejovskiy, F. A.

TITLE: New Data on the γ-Spectrum of Sb^{124} (Novyye dannyye of γ-spektre Sb^{124})

PERIODICAL: Izvestiya AN SSSR, Seriya Fizicheskaya, 1957, Vol. 21, Nr 12, pp. 1614 - 1618 (USSR)

ABSTRACT: In order to give a precise determim tion of the earlier obtained (referenc 1) data on the relative intensity of the γ-lines of Sb^{124} the authors made new investigations of the γ-radiation of Sb^{124} in the elotron under new more favorable conditions (with regard to light intensity and dissolving power). At their disposal was metallic antimony, activated by neutrons , with a weight of $\sim$1,5 g and a total activity of $\sim$ 1,5 Cu. At the beginning of the measurements the age of the preparations was 40 days. Especially carefully investigated were 1.) The soft range of the γ-spectrum $H\varrho$ = 2500 + 3300 Gs.cm in which earlier with gas-filling (reference 1) the elotron could not su fficiently sharply separate the -lines $h\nu$ = 603 keV and 646 keV. 2.) The hard range $H\varrho$ = 4800 + 6300 Gs. cm in which the authors discovered new unknown (till then) γ-lines, where the intensity of those decreased with a period of $\sim$ 60 days.

Card 1/3

48-12-9/15

New Data on the γ-Spectrum of Sb^{124}

The curve of the spectral sensitivity of the apparatus under the new conditions (reference 2) permitted precisely to determine the values of the relative intensity of all γ-lines of Sb^{124}. Three γ-lines $h\nu$ = 603, 646 and 723 keV were, as earlier, determined in the observations. The precisely determined values of the relative intensity of the γ-lines are given in a table, as well as the multipolarity of some γ-transitions cabulated by the authors on the basis of own observations of the intensity of γ-lines and the data by Zolotavin and others (reference 3) on the relative intensities of the K-conversion-lines of Sb^{124}. The scheme of the decay Sb^{124} is given. It is based on the data collected until May 1956 (references 3 and 5) which were more precisely determined here. Regarding the multipolarity of the transitions it is shown that it may with certainty be assumed that the levels 603 and 2295 keV have the characteristics 2^+ and 3^-. The characteristic of the other levels is less certain, partially because of the possibility of a doublet-structure of the lines $h\nu$ = 646 and 723 keV. A comparison with other even-even nuclei shows that the two-quanta oscillation-excitation of Te^{124} in the range 1320 keV ($E_2^*/E_1^* \approx 2{,}2$) must form a triplet $0^+ 2^+ 4^+$. Of these 3 possibilities the characteristic 2^+ must be ascribed to the level 1326 keV, as a) a transition 1326 → 0 and b) a transition 2295 → 1326 (line

Card 2/3

. New Data on the γ-Spectrum of Sb^{124}

$h\nu$ =969 keV) of the type E 1 + M 2 is observed. The data on the lines 646, 1047 and 1450 keV give rise to the assumption that the level 1248 keV is of type 4^+. In the last chapter the balance of the intensities is investigated. It is shown that in case that the levels 1248 and 1326 keV possess the characteristics 4^+ and 2^+ and belong to a triplet, the probability of a β-decay of Sb^{124} (whose original state is of type 3^-) must almost be equal in these levels. There are 4 figures, 2 tables, and 6 references , 5 of which are Slavic.

ASSOCIATION: Radium Institute im. V. G. Khlopin AS USSR
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Card 3/3

PA - 3247

AUTHOR DZHELEPOV, B.S.

TITLE Resonance Scatting of γ- Rays by Nuclei.
(Resonansnoye rasseyaniye γ-luchey na yadrakh .-Russian)

PERIODICAL Uspekhi Fiz.Nauk, 1957,Vol 62,Nr 1, pp 3 - 4e (U.S.S.R.)
Received 7/1957 Reviewed 8/1957

ABSTRACT As nuclei have excited states just like atoms, the possibility of such a scattering is obvious, but experiments carried out in this direction were successful only from 1951 onwards.On the occasion of excitation by a slowing down spectrum, so small a part of the total spectrum is able to take effect because of the small width or of the level that resonance excitation can be determined only from such secondary phenomena as the formation of isomeres of long life and the fine structure of cross sections of $(\gamma,n)(\gamma,p)$ and (γ,t) -reactions. Like in optics excitation by the γ-radiation of nuclei of equal kind would be obvious, but the difference in energy between the impinging and the radiated quantum, which is produced as a result of the transmission of momentum to the nucleus and can be disregarded in optics, is in this case very considerable compared to the width of the energy level at medium energy (of up to 6 MeV), so that the two energy bands hardly overlap. The Doppler effect of heat motion, it is true, increases the cross section about 2e times, but for a further increase of overlapping the following means had to be employed: 1) Heating of the

Card 1/2

DZHELEPOV, B. S.

AUTHORS: Dzhelepov, B. S., Corresponding Member of the AN, USSR, ~~Kraft~~, O. Ye., Preobrazhenskiy, B. K. 20-4-15/51

TITLE: A Study of the β^+ - Decay of Ho^{160} (Issledovaniye β^+ - raspada v Ho^{160}).

PERIODICAL: Doklady AN SSSR, 1957, Vol. 116, Nr 4, pp. 581-583 (USSR).

ABSTRACT: The authors investigated the holmium-fraction, which was separated from a target irradiated by protons with an energy of 660 MeV. The active substance was deposited in a thin layer on a cellophane with a thickness of 17μ. The authors ascertained from a measurement of the electrone spectrum of holmium the lines corresponding to the transitions 197 ± 5; 287 ± 10; 545 ± 20; 652 ± 20; 730 ± 20; 874 ± 25; 974 + 25 and 1315 + 30 keV. The half life of these lines amounts to 4,5 to 6 hours. The conversion electrons corresponding to the transitions 196; 298; 539; 648; 730; 1876; 967 keV appertain to the isotope Ho^{160}, which has a half life of 5,3 hours. For these reasons, the conversion spectrum of the sample is probably due entirely to Ho^{160}. According to the measurements of the authors this spectrum consists of a composite curve. The Curie diagram of this spectrum is also given here. This diagram shows clearly four components of the β^+- spectrum. The maximum energies and the relative intensities of these components

Card 1/3

are given. The half life is equal for all components of the spectrum and amounts to 5,6 ± 0,7 hours. From an analysis of the results obtained here two problems arise: 1) To which of the holmium isotopes appertains the positive radiation? 2) By what process are these positrons produced? Are they actually a result of the β^+ - decay or are these positrons corresponding to a pair conversion of the corresponding transitions? From the considerations of the authors the following springs: Because of the fact, that the β^+ spectrum with a half life of 5,6 hours was observed from a source, which was separated from Er after 45 hours, the assumed Ho^x is obtained from Er^x just like Ho^{160}. (H^x denoting an unknown holmium isotope). 2) The fact, that the ratio S_{β^+}/S_{e^-} from both sources is equal, speaks in favour of a convincing similarity not only of the periods of Ho^{160} and Ho^x, but also of the periods of Er^{160} and Er^x. The fraction of Erbium, which had been kept for 11o hours after the separation was used in an additional experiment, which furnished the same results. The greater number of electrons is probably coming from the β^+ - decay of Ho^{160}. The mass difference between Ho^{160} and Dy^{160} amounts to a value of not less than 292o ± 1oo keV. Further details are given.

DZHELEPOV B. S.

20-1-13/42

AUTHORS: Grigor'yev, Ye.P., Dzhelepov, B. S., Corresponding Member of the AN SSSR, Zolotavin, A. V., Kratsik, B., Preobrazhenskiy, B. K., Yanchevskaya, I. S.;

TITLE: The Conversion Spectrum of Ho^{160} (Konversionnyy spektr Ho^{160}).

PERIODICAL: Doklady AN SSSR, 1957, Vol. 117, Nr 1, pp. 53 - 56 (USSR)

ABSTRACT: The present paper investigates the conversion spectrum occurring in the radioactive transformation Er^{160} Ho^{160} Dy^{160}. The spectrum was investigated by means of a spectrometer with a double focusing. The conversion spectrum is homogeneous in both fractions: Er^{160} does not produce any conversion electrons and all the electrons belong to the Ho^{160}. The results of the investigations of the conversion spectrum are given in a table. The intensity of all the lines observed decreased in a period corresponding to the half-value period of the investigated fractions: 29 hours in the case of the erbium fraction and 5 hours of the holmium fraction. On measuring faults something is said, too. The general form of the conversion spectrum agrees with an earlier discovered form (reference 2). Moreover, some new facts could be explained, which permit the determination of the decay scheme of the Ho^{160}: The lines L_I+L_{II}, L_{III}, M and N of the transition taking place in the Ho^{160} were observed with 60 KeV. The decomposition into the components makes it possible to determine the relative intensity of the lines. The relationship $L_I:L_{II}:L_{III}$ =

Card 1/2

The Conversion Spectrum of Ho^{160}. 20-1-13/42

= o,2:1, 1:1,o determined by the authors for the transition 86,4 keV confirms the multipole property E 2 of which.The line E_e = 99,3 keV discussed in a preparatory paper (reference 2) was identified as the L-line of the transition 1o7 keV by the authors. Moreover the K-conversion line of this transition was found.The conversion line of the transition 298 keV on the K-shell is a narrow doublet with $\Delta E \sim$ 1 keV. Further particulars on these new discovered lines are given.The data given here and the data on the decay of the Tb^{160}(references 7,8,9,1o,11,12)oan be used as fundament for the construction of the decay scheme of Tb^{160} and Ho^{160}.Such a scheme is illustrated by a graph. There are 3 figures, 2 tables, and 12 references, 5 of which are Slavic.

ASSOCIATION: Physics Institute of the Leningrad State University im. A.A. Zhdanov (Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta im. A. A. Zhdanova).

SUBMITTED: September 13, 1957

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Card 2/2

21(7) PHASE I BOOK EXPLOITATION SOV/1101

Dzhelepov, Boris Sergeyevich, and Leon Kaufmanovich Peker

Skhemy raspada radioaktivnykh yader (Decay Schemes of Radioactive Nuclei) Moscow, Izd-vo AN SSSR, 1958. 780 p. 6,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Radiyevyy institut.

Resp. Ed.: Yu. V. Khol'nov; Tech. Ed.: R. S. Pevzner.

PURPOSE: This book is for nuclear physicists and specialists in radio chemistry who are concerned with the nature and mechanism of radioactive decay, isotope formation, or nuclear radiation.

COVERAGE: The present publication incorporates all information available on decay schemes to the end of 1957. The 256 decay schemes include those of many odd-odd isotopes in the domain of deformed nuclei with A=150 – 190 and A> 222 which were rechecked and constructed or essentially changed to correspond with modern conceptions of the unified shell model about the nature of rotational and vibrational levels. If a nucleus has several low levels which are excited only by nuclear reactions but not by processes of radioactive decay, only those levels

Card 1/2

of this type which are energetically accessible for alpha-beta-decay are shown. Alongside alpha- and beta- transitions, the following data are placed: a) energy in KEV b) the intensity of transition (in percents), and the log value of τf (in brackets). All schemes are accompanied by a supplement including experimental data concerning the decay of radioactive nuclei, obtained in the years 1953-1957. Data are included on the values of spins, magnetic dipole and electric quadrupole moments of stabled nuclei, obtained in the same period. Papers published from the beginning of 1950 are included in the bibliography. In the schemes and in the supplement are data which cannot be found in the papers cited and which are mostly added by the authors to their papers contained in the bibliography and published in "Nuclear Science Abstracts", 7-10, No. 24B, 1953 - 1956. Data about alpha-spectra of heavy isotopes (beginning with Ra) are taken from the original papers as well as from the survey by Perlman and Rasmussen (Alpha-radioactivity. Handbuch der Physik. Springer-Verlag, Berlin, 1956). Data about levels and their life time, obtained by the method of coulomb excitation, are given in the survey by Alder, Winter, Huus, A. Bohr, Mottelson (Rev. Mod. Phys., 28, No. 4, 1956).
The authors express thanks to G. Dranizina, D. Varshalovich and N. Bonch-Osmolovskaya for assistance in preparing the book.

TABLE OF CONTENTS: None given

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Card 2/2

DZHELEPOV, B., SHESTOPALOVA, S. and UCHEVATKIN, I.

"On the 2450-3400 keV Region of the RaC Gamma Spectrum,"" Nuclear Physics, Vol. 5, No. 3, Feb 1958. North Holland Publ. Co., Amsterdam.

D. I. Mendeleyev Research Indt. of Metrology, Leningrad.

Abst: Five new RaC γ-lines are reported of higher energy than those known heretofore.

DZHELEPOV, B. S. and ZHUKOVSKIY, N. N.

"On the Gamma Spectra of Ag^{110}, Sb^{124} and $Eu^{152,154}$,"

Nuclear Physics, Vol. 6, No. 5, p. 655, 1958. Nor th Holland Pub. Co.,

Abstract: The elotron, a recoil electron gamma spectrometer with improved focusing properties, was used to study the gamma radiation from Ag^{110}, Sb^{124} and $Eu^{152,154}$

Radium Inst., Acad. Sci. USSR, Leningrad.

DZHELEPOV, B. S. and ZHUKOVSKIY, N. N. (V. G. Khlopin Radium Institute, USSR Acad. Sci. Leningrad) SHESTOPALOVA, S. A. and UCHEVATKIN, I. F. (D. I. Mendeleyev Research Institute of Metrology, Leningrad.

"Gamma-Ray Spectrum of Radium in Equilibrium with its Decay Products," Nuclear Physics, v. 8,3 (1958) (North-Holland Publishing Co., Amsterdam) pp. 250-264.

Abstract: Results are described of an investigation of the radium gamma-spectrum in equilibrium with its decay prdducts, based on recoil electron measurements in the energy range 150-2530 keV. Fourth-Four gamma-lines have been observed, and their relative intensitites and the number of quanta per disintegration determined.

DZHELEPOV, B.S.

AUTHORS: Grigor'yev, Ye. P., Dzhelepov, B. S., Zolotavin, A. V., Kraft, O. Ye., Kratsik, B., Peker, L. K. 48-22-2-2/17

TITLE: The Decay of Tb^{160} and H^{160} and the Level Scheme of Dy^{160} (Raspad Tb^{160} i Ho^{160} i skhema urovney Dy^{160})

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya. 1958. Vol. 22, Nr 2, pp. 101-125 (USSR)

ABSTRACT: Radioactive Tb^{160} was here obtained by irradiation with slow neutrons of chemically pure (99.99%) Tb_2O_3. The position and relative intensity of 19 lines was carefully measured in the conversion spectrum. The decomposition of the known line 963 + 966 keV into two components is essentially new. The relative intensities of the γ-transitions were obtained by means of a division of the line areas through the corresponding photoelectric absorption factor. The values were because of the absorption of the γ-rays corrected in the source itself and at the walls of the cylinder, as well as because of the absorption of the photoelectrons in the target and in the slits of the counter. The obtained relative intensities

Card 1/3

of the γ-lines in the spectrum of photoelectrons are in the range of $\pm 20\%$ in agreement with those of references 5 and 6. The measurements of the conversion spectrum show that the soft component is twice as weak as the hard one. The multiplicity of these transitions apparently is equal and between the intensities of the γ-lines the same relation must exist. - Radioactive Ho^{160} was obtained by irradiation of a tantalum target with protons with an energy of up to 660 MeV. The erbium and holmium fractions were chromatographically separated from the target. In the conversion spectrum all conversion lines of Ho^{160} that had been obtained in reference 8 were also confirmed here and many new ones discovered. It is shown that the transitions to the upper levels are permitted ones. The small number of positrons (one positron) per decay is explained by the fact that at the low decay-energy the K-capture is dominating. When the decay to two upper levels is considered permitted K/β^+ can be determined according to the tables by Zweifel (ref. 10). The values 5400 and 400 thus obtained are very high, consequently a considerable part of all conversions

 of Ho^{160} must take place by way of K-capture. In the

The Decay of Tb^{160} and H^{160} and the Level Scheme of Dy^{160} 48-22-2-2/4

second short chapter the determination of the multiplicity of transitions is shown and its results are given in the form of a table. - In the third chapter the scheme of the Dy^{160}-levels is treated. A level scheme of Dy^{160} was here compiled with the use of all experimental data, theoretical considerations and the analogy with the neighboring nuclei. This scheme in the best manner corresponds to all data. All arguments confirming this scheme are given here and all facts contradicting this scheme or facts which cannot be explained are enumerated. There are 8 figures, 12 tables, and 19 references, 8 of which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta im. A. A. Zhdanova (Institute for Physics in the Leningrad State University imeni A. A. Zhdanov)

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Card 3/3 1. Terbium-Decay 2. Terbium isotopes (Radioactive)

DZHELEPOV, B.S.

AUTHORS: Dzhelepov, B. S., Precbrazhenskiy, B. K., 48-22-2-3/17
Rogachev, I. M., Tishkin, P. A.

TITLE: The Conversion Electron Spectrum of the Dysprosium Fraction (Spektr konversionnykh elektronov disprozyevoy fraktsii)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 2, pp. 126-134 (USSR)

ABSTRACT: Conversion spectra of the neutron-saturated dysprosium isotopes were investigated here. The dysprosium fraction was chemically and chromatographically separated from the tantalum target bombarded with fast protons in the synchro-cyclotron ОИЯИ The irradiation lasted several hours, the separation of the rare earths took place 20-30 hours after the termination of the irradiation. The situation was more complicated than was to be assumed according to the Siborg tables. In the conversion spectrum the authors determined lines whose intensity decreased with half lifes of: a) 7,5 ÷ 11 hours, b) 38 hours and c) 4,7 days. Due to the difficult situation explanations are here given according to groups of half-lifes. The Dy-fraction was investigated in two β-spectrometers with magnetic lenses (magnetic-lens

Card 1/ 4

spectrometer). 1.) In the spectrum of the dysprosium--fraction 15 electron-lines whose intensity decreased with a half-life of 7,5 $\pm$ 11 hours were determined in the range of 3 $\pm$ 150 keV. All lines repeated themselves in 6 series (performed with 2 sources). The value of the half-life of 7,5 hours was determined according to the decrease in intensity of the lines with 7,4 keV. The electron lines with 5,36 and 42 keV are L-MM, K-LL, K-L, and M Auger--electrons, the lines with 13,5, 57,5, 64,0, 74,0 and 81,0 keV were identified as conversion electrons K, L and M of the transitions with 65,5 and 82,5 keV in Tb. The electron lines with 48,0, 92,0, 98 and 142 keV apparently are K and L conversion electrons which correspond to the transitions with 100 and 150 keV, whereas the line with 132 keV apparently corresponds to the K-electrons of the transition with 184 keV. All transitions given here were for the first time observed by the authors. - 2.) Beside the lines with a time of decrease in intensity of about 10 hours 5 weak electron lines with a time of decrease in intensity of about 38 hours were determined in the β-spectrometer with single lens. For the time being it was not possible to ascribe these lines to a certain isotope. - 3.) After these

lines (with 10 hours) weaker lines of the conversion electrons, the intensity of which decreased with a half life of $(4,5 \pm 0,2)$ days became distinctly visible. K- L- and M-electrons of the transitions with 63 and 87 keV L- and M-electrons of the transition with 57 keV, K- and L-electrons of the transitions with 149, 163, 180 and 200 keV, K-electrons of the transitions with 60 and 262 keV were determined. Some of these lines could not be identified. - It is shown that the activity decreasing with a period of 4,5 days can be ascribed to the terbium isotopes. It seems that at least 4 terbium isotopes with a half-life period of about 5 days exist: Tb^{153} (T = 5,1 days), Tb^{155} (T = 5,6 days), Tb^{157} (T = = 4,7 days) and Tb^{161} (T = 6,8 days). Summarizing the authors state that it is possible that Tb^{157} has a half-life of about 5 days, that it is accumulated from Dy^{157} (T = = 8,2 hours) and that some conversion lines corresponding to the period of $\sim$ 5 days might belong to it. The decay--scheme was discussed with L. K. Peker, K. Ya. Gromov helped with the organisation of the works, A. Bagdanov and

The Conversion Electron Spectrum of the Dysprosium Fraction 48-22-2-3/17

A. I. Yashchuk, Student-Diplomants (which prepare for their diplomas) helped with the work.
There are 5 figures, 3 tables, and 9 references, 3 of which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta im. A. A. Zhdanova (Institute for Physics in the Leningrad State University imeni A. A. Zhdanov)

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1. Dysprosium isotopes-Conversion spectra 2. Dysprosium isotopes-Irradiation 3. Rare earth elements-Separation

Card 4/4

DZHELEPOV, B.S.

AUTHORS: Anton'yeva, N. M., Bashilov, A. A., Dzhelepov, B. S., Preobrazhenskiy, B. K. 48-22-2-4/17

TITLE: Spectra of the Conversion Electrons of Gd^{151} and Gd^{153} (Spektry konversionnykh elektronov Gd^{151} i Gd^{153})

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 2, pp. 135-152 (USSR)

ABSTRACT: The conversion spectra of some gadolinium isotopes with long periods were investigated here. They were obtained by a long-term irradiation of the tantalum target in a scattered proton-beam with an energy of 660 MeV. First the fraction of rare earths was separated from tantalum according to ordinary chemical methods and then the pure gadolinium fraction which mainly contained neutron-unsaturated isotopes was separated according to the chromatographic method. The active material was collected on a thin aluminum foil. The investigation of the spectrum of conversion electrons was performed by means of the magnetic spectrometer - the ketron of the University of Leningrad (ref. 2) which has a dissolving power of 0,5%. The film at the counter slit permits electrons

Card 1/4

to pass with an energy of more than 7 keV. The measurements of spectrum were made one month after the termination of the target irradiation and were several times repeated in the course of the following year. It became evident that the slowly changing part of the conversion spectrum belongs to Gd^{153} and Gd^{151}. Moreover the lines belonging to the gadolinium isotopes with shorter periods, which the authors hade become acquainted with in earlier investigations, were observed. At first the spectrum of the conversion electrons of Gd^{153} is dealt with here. A survey of the data published on Gd^{153} is given. From the comparison of those is concluded that the part of the conversion spectrum investigated here belongs to Gd^{153}. It is shown that in the transition with 103,3 keV the ratio K:L = 6,4±0,3 indicates that this transition predominantly belongs to the M 1 - type (perhaps with a small E2-admixture). In the transition with 97,4 keV the magnitude of the ratio K:L = 6,9±0,5 indicates that this transition either belongs to M 1 or E 1. In the 83,6 keV-transition the ratio K:L≈4 shows that in this case E 2 possibly with an M 1 - admixture exists. In the 69,8 keV--transition the ratio K:L = 6 ± 1 shows that here most

probably a mixture of M 1 + M 2 exists. - Regarding the decay-scheme some precise determinations were made here on the intensities of the transitions in the decay $Gd^{153} \longrightarrow Eu^{153}$. It is shown that the intensity of the transition to the ground level amounts to $<10\%$, lg ft $> 7,5$. The 173 keV - level is excited by an instensity of $\sim 12\%$, lg ft-4,7. The most intensively excited ones are the 103,3 keV - level with an intensity of $\sim 46\%$, lg ft-5,9 and the 97,4 keV - level with $\sim 32\%$, lg ft-6,2. The first level of rotation of the fundamental band with 84 keV (the lowest of all known Eu^{153}-levels) is weakly excited, its intensity amounts to $\sim 6\%$. Its excitation is most probably connected with the nuclear transmutations to Eu^{153}. For an explanation of the obtained lg ft - values it can be assumed that the spin of Gd^{153} is equal to 3/2. In the spectrum of the conversion electrons with an activity of long periods obtained here a great number of other lines remained after the deduction of the Gd^{153}-lines. The transition with 21,7 keV observed here is, according to the explanations given here, excited in the decay $Gd^{151} \longrightarrow Eu^{151}$. It is shown that

Spectra of the Conversion Electrons of Gd^{151} and Gd^{153} 48-22-2-4/17

this transition most probably represents a mixture of M 1 + + E 2, as the L_1-peak is considerably higher than the L_2-and L_3-peaks and as the same time $L_3 \sim L_2$. Further transitions are shown and it is stated that by the decay of Gd^{151} to Eu^{151} and by a Coulomb excitation of the latter mainly different nuclear levels and transmutations are produced. Then the decay-scheme of Gd^{151} is given, where two variants are shown. The second variant differs by the fact that here the 155 keV-transition to the ground state of Eu^{151} takes place. V. Il'in, L. Klochkova and L. K. Peker helped with the work. There are 7 figures, 10 tables, and 36 references, 7 of which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta im. A. A. Zhdanova (Institute for Physics of the Leningrad State University imeni A. A. Zhdanov)

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1. Gadolinium Electrons-Conversion spectra
2. Gadolinium isotopes-Irradiation

Card 4/4

DZHELEPOV, B S

48-22-2-5/17

AUTHORS: Gromov, K. Ya., Dzhelepov, B. S., Dmitriyev, A. G., Preobrazhenskiy, B. K.

TITLE: On the Decay of $Nd^{140} \rightarrow Pr^{140} \rightarrow Ce^{140}$ (O raspade $Nd^{140} \rightarrow Pr^{140} \rightarrow Ce^{140}$)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 2, pp. 153 - 157 (USSR)

ABSTRACT: At first a survey on the data hitherto published is given and inconsistencies are pointed out. For this reason the investigations of the Nd^{140} + Pr^{140}-radiation were repeated. The neodymium fraction was here chromatographically separated from a tantalum target irradiated with fast protons (E_p=660 MeV). It was found that after 120 hours the preparation contains nothing but Nd^{140}. The electron radiation accompanying the decay of Nd^{140} and Pr^{140} was investigated by means of a magnetic β-spectrometer of the "ketron"-type. The positron-spectrum in the range of 0,4 + 3 MeV and the electron-spectrum in the range of 12 + 150 keV were investigated. The activity of the preparation was not high. On the basis of the

Card 1/2

On the Decay of $Nd^{140} \rightarrow Pr^{140} \rightarrow Ce^{140}$ 43-22-2-5/17

results in the investigation of the positron spectrum the Curie diagram was constructed. Above 750 keV the latter was linear. The limit energy of the positron spectrum is equal to 2470 keV. The Auger electron lines K-2L and K-LM were discovered in the electron spectrum. The half width of these groups of lines was 9 and 7 %. Other electron-lines were not observed. Under the same conditions as in the case of Nd^{140} the Tu- and Lu-isotopes were investigated here (Refs 11, 12). In some of the isotopes γ-transitions with about 80 keV were determined. The K-conversion lines of these transitions have an energy of about 20 keV. The K-line usually was widened by 1,5 - 2 %. The ε_K/β^+-value here obtain for Nd^{140} Pr^{140} (error not above 30 %) can either be used for the determination of the emission of the K-series of Auger-electrons or for the determination of the β^+/K_Σ - values. There are 4 figures, 1 table, and 12 references, 2 of which are Soviet.

ASSOCIATION: Radiyevyy institut im. V. G. Khlopina Akademii nauk SSSR (Radium Institute imeni V. G. Khlopin AS USSR)

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Card 2/2

1. Neodymium-Decay-Determination 2. Praseodymium-Decay-Determination 3. Cerium-Decay-Determination

DZHELEPOV B.S

AUTHORS: Bashilov, A. A., Dzhelepov, B. S., 33-22-2-10/17
Novosil'tseva, N. D., Chervinskaya, L. S.

TITLE: The Conversion Spectrum of La^{140} (Konversionnyy spektr La^{140})

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 2, pp. 179-190 (USSR)

ABSTRACT: The authors succeeded in separating La^{140} with a high specific activity from Ba^{140} (T= 12,8 days). Prikhodtseva and Khol'nov (Ref 23) performed new measurements on the β-spectrum of La^{140} under perfected conditions, which is detailed in this paper. The first chapter: Experimental conditions deals with the description of the investi ation of the conversion electron spectrum of La^{140}, using a magnetic spectrometer with perfected focusation (ketron). The divergence angle of theelectron beam in the spectrometer was selected in such a way, that it corresponded to the ground conversion lines of La^{140} with respect to width. An usual Geiger-Mueller counter was used for the registration of the electrons: In

Card 1/4

the chapter: The results of investigation: It is stated, that the authors succeeded in determining 28 conversion lines corresponding to the 16 nuclear transitions. Quite as well all lines, which were discovered earlier by Cork et al. could be determined, and besides also the weak K and L lines corresponding to $h\nu$ = 730 keV. In the chapter: The determination of the multipolar order of nuclear transitions into Ce^{140}, The ratio K/L: the authors used the values from tables by L.A. Sliv and I.M. Band (Ref 19) for the coefficients of internal conversion and values by Pouz for the coefficient of internal conversion on the L_I-shell, interpolated according to G.F.Dranitsyna (Ref 20). In this way the theoretical values for K/L at Z = 58 were obtained with respect to the first 6 multipoles. A corresponding table is given here. In the chapter dealing with the quantity α_K it is stated that the authors are familiar with the data on the relative intensities in the spectra of the conversion electrons as well as of the γ-radiation (Ref 23). Thus arises the possiblility to determine the conversion coefficients, if it were possible to combine the scales of two spectra. This could be attained if only the

Card 2/4

multipolar order of one transition were known. In the chapter: γ-γ correlations it is stated, that although the authors did not investigate the correlation between the γ-rays of Ce^{140}, the last obtained experience, however, would enable them to set up the quantum characteristics. The correlation by Bishop and Jorba (Ref 21), Robinson and Madansky (Ref 12), Bolotin (Ref 14) and Coleman (Ref 5) are referred to. In the chapter: The quantum characteristics of the excited states of Ce^{140} the following excited states of Ce^{140} are treated: 1) (E_1 = = 1597 keV) of type 2^+. 2) (E_2 = 2083 keV). Here only one transition to the first level ($h\nu$ = 486,6 keV) is known. The transition from the third state (E_3 = 2412 keV) to the first and second level of Ce^{140} ($h\nu$ = 815,3 and 328,6 keV) could be observed, but no transition to the ground level could be found. 4) The fourth state (E_4 = 2520 keV) "apparently" discharges to all lower levels: 0, 1597, 2083 and 2412 keV, producing γ-radiation with a quantum energy of 2520, 923, 436 and 108 keV. Subsequently a more exact analysis of the mentioned states is given, data on which are compiles into a table.

The Conversion Spectrum of La^{140} 48-22-2-10/17

There are 6 figures, 4 talbes, and 23 references, 6 of which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gos. unive_rsiteta im. A.A. Zhdanova (Physics Institute, Leningrad State University imeni A.A. Zhdanov)

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1. Lanthanum-Conversion spectra

Card 4/4

DZHELEPOV, B. S.

AUTHORS: Dzhelepov, B. S., Kraft, O. Ye., Preobrazhenskiy, B. K., Yushkevich, G. F. 48-22-2-14/17

TITLE: Positron Spectra of the Dysprosium Fraction (Spektry pozitronov disprosiyevoy fraktsii)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958 Vol. 22, Nr 2, pp. 208-210 (USSR)

ABSTRACT: The mentioned dysprosium fraction was here obtained by separation from the tantalum target, which was irradiated by protons with an energy of 660 MeV. In this connection it is stated, that no data can be found in publications on the dysprosium isotope with a half life of 2o hours. Dy^{157} was ascribed to the eighth period (reference 2). From reference 3 it can be seen, that another Dy^{155} exists with a half life of 1o hours. In order to determine which isotopes are contained in the here obtained preparation, its conversion spectrum was investigated, which resulted in the determination of 11 peaks of conversion electrons. 6 of these possessed the same half life of 11 $\pm$ 2 hours. The energy of the electrons amounted to 18o $\mp$ 1o, 27o $\pm$ 15, 32o $\pm$ 2o, 4oo $\pm$ 25, 465 $\pm$ 3o and 61o $\pm$ 3o keV. It was assumed, that these are K-electrons, possessing

Card 1/3

the transition energies 23o, 32o, 37o, 45o, 515, and 66o keV. Such transitions "apparently" correspond to Dy^{155} or Dy^{157} The ratio of the number of positrons and of the number of conversion electron transitions with $h\nu$ = 515 keV was established to be 37,5. A half life of 4,7 days and energies of 98, 112, 132 and 162 keV here corresponded to the four groups of conversion electrons. A comparison with the conversion spectrum of the dysprosium fraction as given in reference 3 permits to assume, that in this case it is concerned with the lines k-148, K-162, K-182 and K-21o, which occur in the decay of Tb^{155} (the first three of them), which also pertains to the decay of Dy^{155} and Dy^{157}. Concerning the 2o hours decay period which was found in this investigation in the dysprosium fraction, it is stated here, that its origin remained unclear. Concerning this it is remarked, that in the measurements of the terbium fraction on a ketron (reference 4) positrons from a decay with a half life of 18 hours and a limit energy of ~28oo keV were observed, which is near to the found half life of ~2o hours. For this reason it is assumed, that the respective positron spectrum refers to the isotope Tb with a half life of 18 hours. There are 4 figures and 4 references, 3 of which are Soviet.

Positron Spectra of the Dysprosium Fraction

48-22-2-14/17

ASSOCIATION: Fizicheskiy institut Leningradskogo gos. universiteta im. A. A. Zhdanova (Physics Institute, Leningrad University imeni A. A. Zhdanov)

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1. Dysprosium fraction-Positron spectra 2. Proton irradiation-Application

Card 3/3

DZHELEPOV, B.S

48-22-2-15/17

AUTHORS: Gustova, L. V., Dzhelepov, B. S., Yermolov, P. F., Chubinskiy, O. V.

TITLE: Hard γ-Radiation From Na^{24} (Zhestkoye γ-izlucheniye Na^{24})

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 2, pp. 211 - 215 (USSR)

ABSTRACT: As an introduction it is referred to already known investigation results (Refs 1 - 15). In this paper the γ-radiation from Na^{24} in the range of energies above 3 MeV with the application of a γ-hodoscope was investigated. Methods of measurement and experimental equipment were used according to data from references 16 and 17. The basic results from Soviet research data from the years 1955 and 1956. In the chapter: The description of experiments it is stated that here a series of experiments was conducted with various sources and with varying magnetic fields. The preparations NaCl and Na_2CO_3 served as sources, being irradiated with slow neutrons. The experiments were divided into two groups. 1) The γ-radiation of Na^{24} was subjected to a thorough investigation with respect to its energetical composition at from 3 + 5,6 MeV. The

Card 1/3

Hard γ-Radiation From Na^{24}

magnetic field was selected in such a way, that the intensity line at $h\nu$ = 2,75 MeV could not be recorded by the apparatus. The measurements were conducted at H = 1360, 1500 and 1675 with a cylindrical counter and at H = 1520 Oe with a rectangular counter. The results from the first group: a) The line $h\nu$ = 3,85 $\pm$ 0,04 MeV was established in the γ-spectrum of Na^{24}. b) The upper limit of the relative intensities of the γ-transitions are compiled in the given table. In the chapter: Evaluation of results: the special characteristics of the β-decay are given, which, in an indirect way substantiates the hypothesis by J. Newton on the possibility of a β-decay of Na^{24} on the level 5,22 MeV of Mg^{24} with a subsequent emission of γ-quanta ($h\nu$ = 3,85 MeV). The final conclusions lead to the assumption that the intensity of the soft β-spectrum with a limit energy of $\sim$ 300 keV is the same as the intensity of the γ-transition, that is to say, 4.10^{-2} % because the other γ-transitions from the level 5,22 MeV cannot be observed here. Therefore the value lg ft = 6,9 was assumed for the soft β-transition. This resutl is given here to represent a permitted β-transition, which is somewhat slowed down by a K-prohibition. The probable value for K = 2 (Ref 21) at the level 5,22 MeV of

Mg^{24}. From this the probable values of the spins 3, 4 and 5 were taken. If I = 4 or 5 the γ-transition from the level 5,22 must pass through the level 4,12 MeV (4^+). Because, however, γ-rays (hν = 1,10 MeV) are unknown, it was assumed here that I = 3 is in accordance with the considerations by Newton. There are 5 figures, 1 table, and 21 references, 5 of which are Soviet.

AVAILABLE: Library of Congress

1. Sodium-Gamma radiation

Card 3/3

SOV/48-22-7-2/26

AUTHORS: Gromov, K. Ya., Dzhelepov, B. S., Preobrazhenskiy, B. K.

TITLE: Conversion Electrons From Yb^{169} (Konversionnyye elektrony Yb^{169})

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol.. 22, Nr 7. pp. 775-784 (USSR)

ABSTRACT: In this paper the spectrum of the conversion electrons of Yb^{169} obtained in a "thorough" (glubok) fission reaction from tantalum (Ref 5) was investigated. - On the basis of a comparison of the experimental data for the factors of internal conversion with theoretical values the following is stated:
1) The α_L-value for the 130,5 keV transition well agrees with the theoretical value for the transition of an E2 type.
2) The α_K-value obtained experimentally permits to maintain that the 118,2 keV transition is a pure E2 transition.
3) A comparison of the experimental and the theoretical value of α_L shows that the 63,1 keV transition is a pure E1 transition.
4) The experimental values of α_K and α_L of the 93,6 keV transition coincide best with the theoretical values for a transition of M1 type.

Card 1/3

5) The experimental values of the conversion factors in the 109,78 keV transition show an extremely good agreement with the theoretical values for a transition of the M1 type. The admixture of E2 apparently does not exceed 10 %.
6) No decision can be made between the M1 and E2 type in the 177 and 198 keV transitions with respect to the intensity of the lines of internal conversion at the K- and L-shells. Presumably it can be maintained that the admixture of E2 in these transitions is not below 20 %. The leading argument substantiating this assertion is the shape of the summary conversion lines at the L-shell (a conversion at the L_{III} sub-shell exists).
7) The value obtained experimentally for the factor of internal conversion at the K-shell for the 261,0 keV transition permits to establish the multipole order of the same - E1.
8) The assumption made by the author of the existence of the γ-transition at 309,2 keV could not be substantiated by γ-rays. Hence the intensity of γ-rays of 307,7 keV given in a paper by Du Mond (Dyumond) can be considered to represent the summary intensity of the γ-rays with an energy of 307,7 and 309,2 keV.

9) The total intensities of the corresponding γ-transitions are given in a table. - The data obtained for the conversion electrons of Yb^{169} substantiate the decay scheme given in references 3 and 4. As an attachment the testing of the calibration of the apparatus for the measurement of the energy is described. There are 7 figures, 3 tables, and 9 references, 5 of which are Soviet.

ASSOCIATION: Radiyevyy institut imeni V. G. Khlopina Akademii nauk SSSR (Radium Institute imeni V. G. Khlopin AS USSR)

SOV/48-22-7-5/26

AUTHORS: Dzhelepov, B. S., Preobrazhenskiy, B. K., Sergiyenko, V. A.

TITLE: Conversion Electron Coincidence in the Decay of $Tb^{155} \longrightarrow Gd^{155}$ (Sovpadeniya konversionnykh elektronov pri raspade $Tb^{155} \longrightarrow Gd^{155}$)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 7, pp. 791-794 (USSR)

ABSTRACT: Tb^{155} was obtained by the irradiation of a tantalum target with protons of an energy of 660 MeV. The irradiation lasted for several hours. The chromatographic separation was carried out 2o-3o hours after irradiation. The coincidence was investigated with the magnetic double-lens β-spectrometer of the State University Leningrad (Ref 1). The investigation was performed as follows: One half of the spectrometer recorded the K- and L-electrons from a certain γ-transition, whereas the other half recorded the K- and L-lines of the other transition. The experimental results compiled in a table show the following: 1) A coincidence of the L-63 and K-262 electrons. The line, which, pending final decision

Card 1/3

Conversion Electron Coincidence in the Decay of $Tb^{155} \rightarrow Gd^{155}$

was denoted as L-63 consists of L-60,00, K-101 and K-105,32. It is possible, however, that also L-57 and L-63, which are generated in transitions, are contained in it. The total number of coincidences of (L-63) (K-262) amounted to 123 pulses per hour. 22 of those were random pulses and 101 were true ones. The existence of coincidences of L-63 and K-262 electrons is beyond doubt. The authors are of the opinion that these coincidences are essentially connected with the cascade of the γ-transitions with hν ~60 and 262 keV in the nucleus of Gd^{155}. 2) Coincidences of L-63 and K-(160 + 161 + 163) electrons. The existence of these coincidences cannot be doubted. The following combinations could take part in coincidences of this type: (L-60,0)(K-160,4), (L-60,00)(K-161,5), (K-101)(K-161,5), (K-105,32)(K-161,5) and (K-105,32)(K-160,4). The existence of these cascades is also substantiated by the complicated character of the spectrum of the coincidence of K-electrons originating from the (160 + 161 + 163)-transitions and from the electrons of the respective line. 3) Coincidence of the K-149- and K-(160+161+ +163)-electrons. The transitions with an energy of hν = 148,8

Card 2/3

Conversion Electron Coincidence in the Decay of $Tb^{155} \longrightarrow Gd^{155}$ SOV/48-22-7-5/26

and 163,4 keV have hitherto not been inserted in the decay-scheme of $Tb^{155} \longrightarrow Gd^{155}$. The coincidences (K-149) [K-(160+161+163)] can be brought into connection with the cascade of the 148,4- and 163,4 keV transitions.
4) Coincidences of the K-(180+181,4)- and (L+M)-87, K-149, K-(160+161+163) electrons. The existence of coincidences of K-(180+181,4) and (L+M)-87 and of K-(180+181,4) and K-(160+161+163) is beyond doubt. That of K-(180+181,4) and K-149 can be assumed. There are 4 figures, 1 table, and 6 references, 4 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gos. universiteta im. A. A. Zhdanova
(Scientific Research Institute of Physics at the Leningrad State University imeni A. A. Zhdanov)

Card 3/3

AUTHORS: Dzhelepov, B. S., [illegible], Demidenko, V. A.

TITLE: Coincidence of Conversion Electrons in the Decay of Lu^{173} (Sovpadeniya mezhdu konversionnymi elektronami pri raspade Lu^{173}). Precise Determination of the Decay Scheme $Lu^{173} \rightarrow Yb^{173}$ (Utochneniye skhemy raspada $Lu^{173} \rightarrow Yb^{173}$)

PERIODICAL: Izvestiya Akademii nauk [illegible], Seriya fizicheskaya, 1958, Vol. 22, Nr 7, pp. 795-807 (USSR)

ABSTRACT: Coincidences between some conversion transitions in Yb^{173} were found by means of a double-lens spectrometer (Ref 1). Yb^{173} is produced in the decay of Lu^{173} ($T \approx 170$ days). The evidence obtained permits a precise determination of the decay scheme of $Lu^{173} \rightarrow Yb^{173}$. In the first chapter the experimental results and a qualitative analysis are given. The Lu^{173} preparation was produced about one year after the lutetium fraction had been chromatographically separated from the tantalum target, which was irradiated with 660 MeV protons. Short-lived Lu-isotopes were lacking. Experimental results: 1) Coincidences (78,7)(106,7) exist without doubt. In

Card 1/5

Coincidence of Conversion Electrons in the Decay of Lu[17?]. Precise Determination of the Decay-Scheme $Lu^{17?} \longrightarrow$ [illegible]

order to prove this, the composition of the lines K-100,7 + + K - LL must be known. This problem is the subject of chapter 4. The proportion of intensity taken by the K-LL electrons is about twice as high as that of the K-LM line. The proportion of K-100,7 is about 1/3 of the intensity of the (K-100,7 + K-LL) lines. 3) The small number of coincidences of (L-78,7)(K-78,7) and (L-78,7)(L-78,7) indicates the degree of admixed K-100,7 + K-LL to the line L-78,7 and of admixed K-2M to the line L-78,7. 3) The coincidences (K-272,5)(K-78,7) are also established to exist. The transition at 272,5 keV is arranged in a cascade with the transition at 78,7 keV. 4) The coincidences (K-[illegible],5)(K-LL) are clearly distinguishable. 5) The coincidences(K-[illegible])(K-100,7) and (K-272,5)(L-100,7) apparently do not exist. 6) The coincidences (K-171,4)(K-78,7) exist, they are, however, not numerous. The number of coincidences (K-171,4)(K-[illegible]), however, is higher by five times. In the second chapter the precisely determined scheme of the decay of $Lu^{17?}$ is given. In this new scheme the transition at 272,5 keV leads to the level E_1 = 78,7 keV. Thus, a new level E_2 = 272,5+78,7 = 351,2 keV is introduced. The

Card 2/5

level of 351,2 keV is not in the rotation band of the ground state and apparently is a one-particle level.(In this range the vibration levels are higher). In the third chapter the quantal characteristics of the excited states of Yb^{173} are investigated. The type of the third level at E = 351,2 keV was still open to question. Evidence is furnished showing that it must be of a $7/2^+$-type. Even if deviations from theory of three orders of magnitude are assumed to exist, the uniqueness of the conclusions is not diminished.
In chapter 4 the relative probabilities of the transitions in the decay of Lu^{173} are precised.
The 5th section deals with an investigation of the relative intensity of capture at the different levels of Yb^{173}. It is shown that the quantal characteristics of the ground state of Lu^{173} coincide with that of the excited state of Yb^{173} at an energy of 351,2 keV. The transition between these two levels must be a permitted one. From parity considerations it appears that the transitions to all lower levels of Yb^{173}

Coincidence of Conversion Electrons in the Decay of Lu^{173}. Precise Determination of the Decay-Scheme $Lu^{173} \longrightarrow Yb^{173}$

are forbidden. Among these, the transition to the $7/2^-$ level is the most probable one.

The quantitative analysis of the $e^- - e^-$ coincidences in the decay of $Lu^{173} \longrightarrow Yb^{173}$ is the subject of the 6th section. Based upon a comparison of the experimental and the computed coincidence rate the following is stated: 1) The experimental coincidence rate differs from the computed one by a factor of 7 - 9, if the K-78,7 line comes in in the measurements. This is probably due to the fact that the K-78,7 line, being the weakest one in the spectrum of conversion electrons, is not recorded by the coincidence counter. 2) For coincidences not connected with the K-78,7 line the experimental and the theoretical values agree within a limit of $\pm$ 25 % with each other. The second-year students of the State University/Leningrad, V. Bunakov and A. Myakusheva assisted in the coincidence measurements.

A. N. Murin, G. M. Gorodinskiy and V. N. Pokrovskiy communicated the results of the investigation of the γ-spectrum of Lu^{173} to the authors previous to the publication of their

SOV/48-22-7-6/26

Coincidence of Conversion Electrons in the Decay of Lu^{173}. Precise Determination of the Decay-Scheme $Lu^{173} \longrightarrow Yb^{173}$

paper. There are 7 figures, 7 tables, and 19 references, 6 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gos. universiteta im. A. A. Zhdanova
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Card 5/5

SOV/48-22-7-12/26

AUTHORS: Grigor'yev, Ye. P., Dzhelepov, B. S., Zolotavin, A. V.

TITLE: Relative Intensities of γ-Transitions of Ho^{160}
(Otnositel'nyye intensivnosti γ-perekhodov Ho^{160})

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 7, pp. 821-823 (USSR)

ABSTRACT: Reference is made to previous papers (Refs 1, 2). A knowledge of the accurate thickness of the bismuth target permitted to determine the ratio between the intensities of the lines $h\nu$ = 196 keV and of harder lines. In these measurements one and the same source was used. The energies and the intensities of the 6 strongest γ-transitions were determined. On the basis of the relative intensities of the γ-radiation and the results from the examination of the conversion spectrum of Ho^{160} it is possible to determine the factors of transition-conversion and their multipole order. This can be done if it is taken into consideration that the 196 keV transition takes place between the levels of the first rotation-band of Dy^{160} 4^+ and 2^+. It is assumed that the conversion factor of this

Card 1/3

transition is equal to the theoretical one for the electric quadrupole radiation. In this manner the conversion factors for the other transitions are obtained. The results completely substantiate the assumption made by the authors concerning the level scheme of Dy^{160} from reference 2. The positive parity of the 1695 keV level is now proved and a spin-value of 4 is very probable. The 729 keV transition in this case is E2, whereas the 646- and 538 keV transitions are a mixture of E2 and M1 or of E2 . The hard component of the doublet 963-966 keV is a pure E2 transition. Hence the multipole order of the 963 keV transition is M1 or E2 + M1. The 873- and 879 keV transitions most probably have a multipole order of E2 + M1. According to measurements of the spectrum of the photoelectrons the correctness of the computed intensities of the transitions of 538, 646, 873 + 879 and 963 keV is proved. Fluctuations within the limits of 30-40 % were found in the intensity of the 730keV transition. The staff of the OIYaI and of the Radium Institute assisted in the irradiation of the tantalum target and in the preparation of pure erbium- and holmium-preparations. There are 2 figures, 2 tables, and 4 references, 4 of which are Soviet.

Relative Intensities of γ-Transitions of ^{160}Yb [illegible] 07-12/26

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gos. universiteta im. A. A. Zhdanova
(Scientific Research Institute of Physics at the Leningrad State University imeni A. A. Zhdanov)

Card 3/5

1.

SOV/48-22-7-15/26

AUTHORS: Grigor 'yev, Ye. P., Dzhelepov, B. S., Zolotavin, A. V., Mishin, V. Ya., Prikhodtseva, V. P., Khol'nov, Yu. V., Shchukin, G. Ye.

TITLE: Radiation From As^{74} (Izlucheniye As^{74})

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 7, pp. 831-838 (USSR)

ABSTRACT: In December 1957 the authors obtained a radiochemically pure preparation of As^{74} (~4 mCu) with a good specific activity. The characteristic features of this decay were examined and precisely determined. First the production of the preparation is described. This As^{74} was produced by a bombardment of germanium with deuterons with an energy of 10,8 MeV. The results of the investigation of β^+ - and β^--spectra are exposed. It is proved that the ground state of As^{74} is of an 2^--type. After the "bypass" [illegible] spectra had been subtracted the Curie diagrams for the soft components of both spectra proved to be rectilinear. In the back-ground of the β^--spectrum the K- and (L+M) conversion-lines of the transitions of 596 and 635 keV are clearly marked. The K-635 line is, without doubt,

Card 1/4

a transition of the type $2^+ \longrightarrow 0^+$. With the $h\nu$ = 596 keV transition, which is connected with the positron branch, conditions are more complicated, as the proportion of the K-capture must be known in order to be able to determine α_K. Two methods of the determination of α_K are given. The spectrum of the γ-radiation of As^{74} was investigated by means of the recoil electrons. The relative intensity of three γ-lines was investigated with an equipment of a better resolution: The annihilation line, at $h\nu$ = 586- and the 635 keV line. With the help of an equipment of a lower resolution, but of a luminous intensity amplified by the hundredfold, it was attempted to find harder γ-lines in the radiation of As^{74}. The decay energy in the transmutation from $As^{74} \longrightarrow Ge^{74}$ gives rise to the assumption that the levels of Ge^{74} are excited up to those of 2500 keV. Actually in the spectral range of 1200 keV a pronounced superelevation of the counting rate above the quiet background connected with the softer lines was observed. The intensity of this line is smaller by a factor of 220 than that of the annihilation line. It is shown that in Ge^{74} the second level of excitation probably has an energy of 1200 keV. If this is true, it should be expected that a transition from the second level to the first one

about 600 keV exists and that this level forms a doublet with the 596 keV line. The ramifications in the decay scheme of As^{74} are investigated. In the last chapter some remarks concerning the individual levels are given. As regards the conversion of the transition at $\Delta E = 596{,}3$ keV of Ge^{74} it is shown that in this transition the ratio is $K/L = 9{,}6 \pm 2{,}1$. In the investigation of the ratio K/β^+ in the As^{74} decay to the level at 596,3 keV of Ge^{74} it is shown that the ratio K/β^+ for this transition is normal. The level at 1200 keV of Ge^{74} is probably a second vibration level with the characteristic 2^+. The second excited level of Se^{74} is probably near 1300 keV and is of the type 2^+.
B. M. Isayev, I. P. Selinov, Ye. Ye. Baroni, Ye. N. Khoprov and their team collaborated in the work. There are 5 figures, 3 tables, and 15 references, 8 of which are Soviet.

SOV/48-22-7-17/26

AUTHORS: Dzhelepov, B. S., Zhukovskiy, N. N., Uchevatkin, I. F., Shestopalova, S. A.

TITLE: New Data on the Relative Intensities of the γ-Lines of Ra in Equilibrium With Its Decay Products (Novyye dannyye ob otnositel'nykh intensivnostyakh γ-liniy Ra, nakhodyashchegosya v ravnovesii s produktami raspada)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 7, pp. 841-847 (USSR)

ABSTRACT: In order to examine and precise the data from reference 1 on the relative intensities in the spectrum of the γ-radiation of radium C this spectrum was again investigated in the "elotron" of the Radium Institute (Ref 2). 2 grams of radium in the compound $RaBr_2$ served as a source of γ-radiation. The shape of the source was identical with that one used in reference 1. The results are as follows: 1) Range from ~150 to 630 keV: This section of the spectrum up to the line at 609 keV was investigated for the first time by means of the recoil electrons. Apart from the well known lines of radium B at 241,9, 295,2 and 352,0 keV a pronounced excess

Card 1/4

of recoil electrons was observed near the line at 295,5 keV. The decomposition showed that the excess maximum is located at 285 keV. Between the intensive lines at 352 and 609 keV a number of less intensive γ-lines is found. It seems as if some of them correspond with not identified lines from reference 3, that is to say with Nr 68, 70, 77, 78 and 79. If these lines are considered to be K-conversion electrons of radium C, energy values of 386,8, 388,9, 466,7, 471,2 and 484,6 keV are obtained.

2) Range from 630 to 1810 keV: The line at 666 ± 7 keV is clearly visible, the lines at 703,2 and 721 ± 7 keV appear. The line at 652,4 keV was not found. Apart from the line at 768,7 keV three lines exist in the high energy range: 787,1, 806,3 and 837±8 keV. The following new γ-lines were found: 885 ± 10, 960 ± 5 and 1050 ± 10 keV. The line at 1541 ± 5 keV was clearly marked. A noticeable broadening of the line at 1764,4 keV and the existence of the lines at 1783,8 and 1790,7 keV (Ref 1) was not ascertained.

3) Range from 1780 to 2530 keV: Apart from the known

1848,5 keV-line an electron excess with a maximum near 1860 keV was discovered. This excess can be explained by the presence of the 1862,3 keV line (Ref 1). The existence of the 1900 keV line (Ref 1) was proved. An excess of recoil electrons exists in the range of 2016,7 and 2090 keV. Their intensity is smaller by about a factor of 3 than that given in reference 1.

For the purpose of determining the relative intensities the area of each component, reduced to equal Hρ intervals, was measured. Then corrections were added. The corrections took into account the efficiency of the counters for electrons of different energies, the self-absorption in the source, the wall absorption, and the spectral sensitivity of the apparatus. It was assumed that the intensity of the lines is proportional to these areas. The results show a good agreement. The intensity of the individual strong lines agree within limits of 7 - 10 %. The Graduate students F. A. Predovskiy (LPI) and N . A. Voinova (LGU) assisted in the measurements. There are 4 figures, 1 table, and 6 ref-

New Data on the Relative Intensities of the γ-Lines of Ra in Equilibrium With Its Decay Products

erences, 2 of which are Soviet.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut metrologii im. D. I. Mendeleyeva
(All Union Scientific Research Institute of Metrology imeni D. I. Mendeleyev)
Radiyevyy institut im. V. G. Khlopina Akademii nauk SSSR
(Radium Institute imeni V. G. Khlopin, AS USSR)

AUTHORS: Anton'yeva, N. M., Bashilov, A. A., Dzhelepov, B. S., Preobrazhenskiy, B. K. SOV/49-22-8-1/20

TITLE: The Spectrum of Conversion Electrons of Gd^{149} (Spektr konversionnykh elektronov Gd^{149})

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 895-905 (USSR)

ABSTRACT: The radioactive Gd^{149} isotope was discovered by Hoff, Rasmussen and Thomson in 1951 (Ref 3), who observed the nuclear reactions of $Sm^{147}(\alpha,2n)Gd^{149}$ and $Eu^{151}(p, 3n)Gd^{149}$. In later years it was found (Ref 4) that Gd^{149} is transformed into Eu^{149} by electron capture (>99%) with a half life of 9± 1 days and into Sm^{145} ($\sim 10^{-3}$%) by alpha-particle emission with an energy of 3 MeV. The spectra of conversion of electrons and those of γ-rays had previously not been investigated. The basic experimental data were supplied by the authors at the 7th All-Union Conference of Nuclear Spectroscopy in January 1957. The present paper contains data concerning

Card 1/4

Gd^{149}, which were published in 1957 (Refs 6-8), as well as results of investigations carried out by the authors. The transition processes attributed by the authors to Gd^{149} are given in table 1. Conversion lines K-149,8 and L-149,8 are to be seen in figure 1 only. The lines between the intervals 220-360 and 400-550 keV are also shown in figures 3 and 4. They concern a later moment at which the short-lived Gd^{147} isotope ($T_{1/2}$ = 35 hours) had already decayed. Long-lived Gd^{151} and Gd^{153} isotopes in these intervals result in lines K-243, K-306, K-350 etc., which show low intensity in the case of short irradiation and can not be distinguished at such a scale as in figure 3. The values K:L mentioned in table 1 are, according to available data, the arithmetical mean of about 10 series of measurements. Burin et al. (Refs 6 and 7) state that by means of the scintillation counter they observed γ-rays of Gd^{149} with the following energies: E_γ = 150, 300, 347 and 520 kev. Recently the paper by Rasmussen and his collaborators has been published (Ref 8) by which the

radiation of Gd^{149} was investigated. For reasons of comparison data are given of that paper for powerful conversion lines in table 1. The two results agree well (up to 149,8 keV). In addition, some faint lines were attributed to the Gd^{149} isotope in the paper mentioned. The identification of these lines, however, is not quite reliable. The data obtained from the spectrum of the conversion electrons of Gd^{149} permit some conclusions concerning the types (multipole order) of the nuclear transition in Eu^{149}. For this reason the results of measurements (table 2) are compared with the computed ones. The scheme of the decay of $Gd^{149} \longrightarrow Eu^{149}$ suggested here is shown by figure 5. The energy of decay is computed by Levi on the basis of the empirical formula for atomic masses, see reference 11. In view of the fact that the nuclei ${}_{64}Gd^{149}_{85}$ and ${}_{63}Eu^{149}_{86}$ have less than 88 neutrons, it must be concluded that they belong to the category of the spherical ones as described by Mayer's model.

The authors thank the head of the laboratory for nuclear problems OIYaI V.P. Dzhelepov and the staff of the synchrocyclotron and they also express their gratitude to A.N. Murin, G.M. Gorodinskiy, V.N. Pokrovskiy, V.A. Sergiyenko, L.A. Sliv and I.M. Band.

There are 5 figures, 2 tables, and 11 references, 7 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gos. universiteta im. A.A. Zhdanova (Scientific Research Institute of Physics, Leningrad State University imeni A. A. Zhdanov)

AUTHORS: Anton'yeva, N. M., Bashilov, A. A., Dzhelepov, B. S., Preobrazhenskiy B. K.

SOV/48-22-8-2/2o

TITLE: Conversion Electron Spectra of Gd^{147} and Eu^{147} (Spektry konversionnykh elektronov Gd^{147} i Eu^{147})

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 906 - 918 (USSR)

ABSTRACT: This is a study of the spectra of the conversion electrons of Gd^{147} and of its decay product Eu^{147} under the same experimental conditions as in the study of Gd^{149} (Ref 1). The basic experimental results were communicated at the 7^{th} All Union Conference of Nuclear Spectroscopy in January 1957 (Ref 2). First the summary spectrum of the gadolinium fraction was investigated, this spectrum is comprising lines from several isotopes. It can be concluded, that the Gd isotope with a half-life of $T_{1/2} = 35 \pm 1$ hours transmutates into a radioactive Eu isotope. This by means of an electron capture with a half life of $T_{1/2} = 25 \pm 1$ days again transmutates into Sm entrailing nuclear transitions with energies of 120 and 200 keV. Control experiments were conducted

with europium separated chromatographically from gadolinium. According to informations available in publications (Ref 3) the activity of europium with a half life of 24 days which is accompanied by a γ-radiation with 120 and 200 keV originates from the isotope Eu^{147}. Hence the Gd isotope decaying with a half-life of 35 ± 1 hours is considered to be Gd^{147}. The overall spectrum of the conversion electrons of the gadolinium fraction in the energy range below 500 keV is presented in the previous paper (Ref 1, Fig 1). In this paper a section of the spectrum below 400 keV is presented with the exclusion of the other isotopes of Gd and Eu (Fig 3). The section of the spectrum between ∿ 400 keV and ∼ 1,5 MeV is given in figure 4. The evidence collected and some supplementary data permit to draw conclusions concerning the multipole order of the transitions to the ground state in Eu^{147}. Experimental values of K/L,α and of other quantities are compared with theoretical values in table 2. Energy relations between the transitions and a rough estimation of their intensities suggest a decay scheme as given in figure 5. The total picture of the Eu^{147} conversion electron spectrum is given in figure 7. The decay scheme $Eu^{147} \rightarrow Sm^{147}$ was

recently subjected to a closer investigation (Ref 9), by which this scheme was supplemented by the transitions 76,5, 600, 676 and 800 keV (Fig 8). The decay energy was computed on the basis of the empiric formula for atomic masses by Levy (Ref 8). The intensity data on nuclear transitions permit to compute approximately the relative probabilities of electron capture in Eu^{147} leading to different levels of Sm^{147}. In order to determine the probability of the capture leading to the normal state of Sm^{147} it would be necessary to know the total number of Auger (Azhe) electrons. As the authors, however, had no preparations of pure Eu^{147} at their disposal, the values used in the computation of the relative probabilities of the decay of Eu^{147} to different levels were taken from reference 9. The authors express their gratitude to the Director of the Laboratory of Nuclear Problems OIYaI V.P.Dzhelepov and to the synchrocyclotron staff as well as to A.N.Murin, G.M.Gorodinskiy, V.N.Pokrovskiy, V.A.Sergiyenko and L.A.Sliv and I.M.Band. There are 8 figures, 4 tables, and 12 references, 9 of which are Soviet.

Conversion Electron of Gd^{147} and Eu^{147} SOV/48-22-8-2/2o

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gos.universiteta im.A.A.Zhdanova (Scientific Research Institute of Physics at the Leningrad State University imeni A.A.Zhdanov)

Card 4/4

AUTHORS: Grigor'yev, Ye. P., Dzhelepov, B. S., Zolotavin, A. V., Mishin, V. Ya. SOV/49-22-8-4/20

TITLE: Conversion Electron Spectrum of As^{73} (Spektr konversionnykh elektronov As^{73})

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 927 - 930 (USSR)

ABSTRACT: The basic features of the decay scheme of As^{73} are already known. The scheme suggested in reference 1 and precised in the references 2-4 is given in figure 1. The authors used a β-spectrometer with a resolving power of 0,4% (Ref 5). The As^{73} source was obtained by a bombardment of natural germanium with deuterons with an energy of 10,8 MeV. The source contained As^{73} and residual quantities of As^{74}. The production method is described in reference 6. The information obtained permits to precise the transition type hv = 52,8 keV. At present no accurate conversion coefficients on the L-shell are available for low energies and for different values of Z. The ratio K_2/L_2 was compared with the coefficients computed by L.A.Sliv and I.M.Band which were obtained by an extrapolation of the coefficients (Table 2). It can be seen that a combined

Card 1/3

utilisation of the quantities K/L and α_k permits to exclude all types except M2. The authors investigated the possibilities offered in the selection of the characteristics of the second level of Ge^{73}. The initial data are obtained from the decay of As^{73}. The ground state of this nucleus is probably $p_{3/2}$. This value is predicted in the scheme by Mayer which is substantiated with a number of nuclei with odd A and 31 or 33 protons or neutrons. A comparison of the decay energy and of the life of As^{73} permits to determine $lg\tau f$ for an electron capture: $lg\tau f = 5,5$. This value is typical for allowed transitions. Hence it follows that the level at 66 keV Ge^{73} is of the type $p_{1/2}$, $p_{3/2}$ or $f_{3/2}$. In table 3 the upper limit of the ratios of the K-conversion lines of the transitions 66,3 and 52,8 keV is given. This ratio was computed according to Weisskopf (Vayskopf) under the assumption, that the multipole order of the transition 66,3 keV is E3 and M1. This is given as a comparison. The ratios L(M + N) for the transition 52,8 keV are of interest. The existence of 2 isotopes As^{73} and As^{74} in the preparation investigated by the authors permitted to compare their relative

amounts during measurement and to compute the ratio of their yields in the nuclear reaction. The authors expressed their gratitude to B.M.Isayev, I.P.Selinov, Ye.Ye. Baroni and Ye.N.Khaprov. There are 3 figures, 3 tables, and 8 references, 3 of which are Soviet.

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AUTHORS: Dzhelepov, B. S., Preobrazhenskiy, B. K., SOV/48-22-8-5/20
Rogachev, I. M., Tishkin, P. A.

TITLE: Conversion Electron Spectrum of the Cerium Fraction (Spektr konversionnykh elektronov tseriyevoy fraktsii)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 931 - 934 (USSR)

ABSTRACT: The activity of the cerium fraction in all sources obtained by the authors by irradiation at different times was small. At the beginning of the measurements the counting rate of the most intensive conversion line was 900 pulses per minute. The spectrum of the conversion electrons is shown in figures 1 and 2. Table 1 gives the energies of the lines, their possible identification and their relative intensities. The 15 electron lines that are found are classified into 3 groups according to their half-life. The intensities of the electron lines with energies of 126,2 and 159,1 keV decreased very slowly. These lines are apparently produced by the K- and (L + M) conversion electrons of the well known γ-transition hν=165 keV of the Ce^{139} isotope ($T_{1/2}$ = 140 days). The

Card 1/3

intensity of the electron lines 212,8 and 248 keV decreased with a half-life of 33 hours. These lines can be identified as K- and (L + M) conversion lines of γ-transition. The value of the ratio K/(L + M) indicates a multipole type E3 (Table 2). An isomeric state with an energy of 256 keV corresponding to a half life of 34,5 hours (Ref 7) exists in the isotope Ce^{137}. The authors are of opinion that considering the comparability of the decay energy (half-life energy) and of the multipole order energy of the observed transition with the data of the isomeric transition in Ce^{137} the activity with a half-life of 33 hours could be ascribed to Ce^{137}. These data do not contradict the decay scheme suggested by Brosi and Kerbells The intensity of the remaining lines decreased with a half-life of 17 hours. The evidence obtained by the authors is not sufficient to ascribe the lines with a $T_{1/2}$ of 17 hours to one definite Ce-isotope or to one of its daughter products, or to set up decay schemes. The authors express their gratitude to the synchrocyclotron staff and to I.A.Yutlandov. There are 2 figures, 2 tables, and 8 references, 4 of which are Soviet.

Conversion Electron Spectrum of the Cerium Fraction SOV/48-22-8-5/20

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Card 3/3

DZHELEPOV, B.S

AUTHORS: Dzhelepov, B. S., Preobrazhenskiy, B. K., SOV/48-22-8-8/20
Sergiyenko, V. A.

TITLE: Conversion Electron Coincidences in the Decay $Eu^{147} \rightarrow Sm^{147}$ (Sovpadeniya konversionnykh elektronov pri raspade $Eu^{147} \rightarrow Sm^{147}$)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22, Nr 8, pp. 945 - 948 (USSR)

ABSTRACT: The authors employed a double lens β-spectrometer (Ref 1) in the investigation of the coincidences between the conversion electrons produced in the decay $Eu^{147} \rightarrow Sm^{147}$ ($T_{1/2} \sim 25$ days). $Eu^{147} \rightarrow Sm^{147}$ γ-transitions with energies of 121,0 and 197,6 keV (Refs 2 - 4) were found in the $Eu^{147} \rightarrow Sm^{147}$ - decay. The transition with an energy of 80 keV which was found in the paper given by reference 3 and in the experiments could not be observed in this investigation. However, conversion lines with 76,3 keV were found (Ref 2). The spectrum of conversion electrons up to an electron energy of 200 keV was taken with one half on the spectrometer. The source was directed with its active side towards the spectrometer.

Card 1/3

(Fig 1). The number of conversion lines, their position within the spectrum and their relative intensities agreed with the data presented by Gorodinskiy et al.(Ref 3). Because of an insufficient resolving power of the spectrometers the K and the (L + M) lines of the transition 76,3 keV did not stand out clearly. The L-line could not be recorded separately from the K-LL line of the Auger (Azhe) electrons and the (L + M) line could not be distinguished from the K-121,0 line. Coincidences were observed between the K-121,0 and K-197,6, the (L + M)-197,6 and (L + M)-121,0 electrons with the K-Auger electrons as well as the coincidences of the K-121,0 electrons through the slit in order to determine the (L + M) lines of the 76,3 keV transition. Besides, coincidences between the K-121,0 and the K-Auger electrons were recorded. The number of true coincidences varied between 3,5 and 179 pulses per $minute^{-1}$. The ratio of true and random coincidences was 9 : 1. The experimental results are compiled in a table and described (Figs 2,3). The data collected agree with the decay scheme of Eu^{147} (Ref 5). The authors acknowledge the

Conversion Electron Coincidences in the Decay $Eu^{147} \rightarrow Sm^{147}$ SOV/48-22-8-8/20

interest shown by A.A.Bashilov. V.Bunakov and Yu.Zvol'skiy assisted in the measurements. There are 3 figures, 1 table, and 5 references, 5 of which are Soviet.

ASSOCIATION: Nauchno-issledovatelskiy fizicheskiy institut Leningradskogo gos.universiteta im.A.A.Zhdanova (Scientific Research Institute of Physics at the Leningrad State University imeni A.A.Zhdanov)

Card 3/3

AUTHORS: Dzhelepov, B. S., Preobrazhenskiy, B. K., SOV/48-22-8-9/20
Sergiyenko, V. A.

TITLE: Conversion Electron Coincidences in the Decay $Tu^{167} \rightarrow Er^{167}$ (Sovpadeniya konversionnykh elektronov pri raspade $Tu^{167} \rightarrow Er^{167}$)

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol. 22 , Nr 8, pp. 949 - 951 (USSR)

ABSTRACT: The authors investigated the conversion electron coincidences between the conversion transitions of the decay $Tu^{167} \rightarrow Er^{167}$ ($T_{1/2} \sim 9{,}6$ days) with a β-double spectrometer (Ref 1). Tu^{167} was obtained by bombarding a tantalum target with 600 keV protons. The neutron deficient Tu-isotopes were separated from the rare earth fractions in a chromatographic column. In the decay $Tu^{167} \rightarrow Er^{167}$ transitions with the following energies take place (Ref 2-4): 56,9 and 208,1 keV (average values according to references 2 and 4). The spectrum of the conversion electrons of Tu^{167} in the range to about 200 keV was taken by one half of the spectrometer (Fig 1). The position of the lines and their relative intensities agree

Card 1/3

Conversion Electron Coincidences in the Decay $Tu^{167} \rightarrow Er^{167}$

SOV/48-22-8-9/20

with the spectrum given in reference 2. The coincidences between the conversion electrons of the transitions with $h\nu$ = 96,9 and 208,1 keV and between those electrons and the Auger electrons from the K-series were examined by the authors. The results are compiled in the table and explained (Fig 2). The decay scheme $Tu^{167} \rightarrow Er^{167}$ which was advocated in the references 2 and 3 (Fig 1) is substantiated by the experimental results. The authors express their gratitude to K.Ya.Gromov and to the students of the Leningrad State University, V.Bunakov and L.Popenko. There are 2 figures, 1 table, and 12 references, 6 of which are Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy fizicheskiy institut Leningradskogo gos.universiteta im.A.A.Zhdanova (Scientific Research Institute of Physics of the Leningrad State University imeni A.A.Zhdanov)

Card 2/3

Conversion Electron Coincidences in the Decay $Tu^{167} \rightarrow Er^{167}$

SOV/48-22-8-9/20

Card 3/3

[illegible]: Basina, A. [illegible], [illegible]kova, [illegible] [illegible]
Dzhelepov, [illegible], [illegible]

[illegible]: Investigation of the [illegible] of γ-Quanta in the Annihilation of Positrons [illegible] hydrogen and Helium (Issledovaniye uglovogo [illegible] γ-kvantov pri annigilyatsii pozitronov [illegible])

[illegible]DICAL: Izvestiya Akademii nauk [illegible], [illegible], 1958, Vol. 22, Nr 8, pp. [illegible]

[illegible]TRACT: On the basis of the [illegible] available, it is [illegible] to clarify completely the mechanism of positron annihilation in condensed media. It was found that the annihilation mechanism is different, at least to a certain extent, in [illegible] and in amorphous media. As a rule [illegible] the annihilation process of positrons takes place only in fr[illegible] number of positrons is r[illegible] with t[illegible]

average li[illegible] (in all metals [illegible]) [illegible] substances, however, [illegible] visible in the decay curves which correspond to [illegible] annihilation mechanism with [illegible] periods of $\sim$[illegible]

[illegible] 1/4